APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/890,703	10/02/2001	Motohito Nakagawa	ASA-1016	6297

24956 7590 09/14/2005

MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C.
1800 DIAGONAL ROAD
SUITE 370
ALEXANDRIA, VA 22314

EXAMINER	
OPSASNICK, MICHAEL N	

ART UNIT	PAPER NUMBER
2655	

DATE MAILED: 09/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/890,703	NAKAGAWA ET AL.
	Examiner	Art Unit
	Michael N. Opsasnick	2655

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 October 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10 and 12-28* is/are rejected.

7)☒ Claim(s) *11* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 August 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Allowable Subject Matter

1. Claims 7-10,12-19,22-24,26,27 are allowable over the prior art of record, and would be allowed after being amended to overcome the 35 USC 101 rejections noted below.

2. Claims 5,6 are objected to as being dependent upon a rejected base claim, but would be allowable over the prior art of record, if rewritten in independent form including all of the limitations of the base claim and any intervening claims, and would be allowed after being amended to overcome the 35 USC 101 rejections presented below, and rewritten to overcome the claim objections presented below.

3. Claim 11 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

4. The following is a statement of reasons for the indication of allowable subject matter:

As per independent claims 7,22,26, the recited claim language pertaining to one-dimensional Gaussian distributions having identical averages and different dispersion factors wherein the value of the access pointer for each feature component uses the dispersion value when selecting the sets of x-direction arrays and uses the average value when determining the location of the x direction array, tied into the intermediate table (which represents the quantization relationship between the input vector and the quantized input vector representation) is not explicitly taught by the prior art of record. As per dependent claim 5, the recited claim

language pertaining to one-dimensional Gaussian distributions having an average and different dispersion factors (as defined in the specification pp 64 –65), wherein the value of the access pointer for each feature component uses the dispersion value when selecting the sets of x-direction arrays and uses the average value when determining the location of the x direction array, tied into the intermediate table (which represents the quantization relationship between the input vector and the quantized input vector representation) is not explicitly taught by the prior art of record. Furthermore, it would not have been obvious to one of ordinary skill in the art of HMM recognition to modify the teachings of the prior art of record to obtain the recited claim limitations noted above.

With respect to the prior art of record, Watanabe et al (5754681) teaches the calculation of an eigenvector space manipulating the variance and mean (col. 16 lines 53 –56); Zhao (5193142) teaches the Gaussian density function to be proportional to the dispersion (col. 2 lines 19-37) teaches a calculation to measure dispersion above and below the mean (Fig. 8); Komori et al (6108628) teaches calculating the Bhattacharyya distance between two speakers for a corresponding phoneme (col. 4 lines 20-38).

Claims 6,8-19,23,24,27 are allowable over the prior art of record because these claims depend from claims (5,7,22, respectively) that have been determined to be allowable over the prior art of record.

Drawings

5. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description:

In Figure 2, labels 113,114,116;

In Figure 4, label 215;

In Figure 16, labels 801,802;

In Figure 19, labels 1104,1155;

In Figure 20, labels 1206,1252;

In Figure 23, label 1452;

In Figure 24, labels 251,1502;

In Figure 25, labels 1453-1, 1453-2, 1504, 1551, 1552, 1605;

In Figure 26, labels 1051, 1706-2, 1751;

In Figures 27+28, labels 1751,1803-5:A-B, 1853-4:A-B;

In Figure 30, labels 2006;

In Figure 33, label 2104;

Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet

submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

6. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: On page 54, line 1, label 1053; and on page 77, line 13, reference to "Fig. 44". Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

7. Applicant is reminded of the proper language and format for an abstract of the disclosure.

<u>The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited</u>. The form and legal phraseology often used in patent claims, such as "means"

and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

8. The abstract of the disclosure is objected to because of undue length (see emphasis above). Correction is required. See MPEP § 608.01(b).

9. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: “Hidden Markov Model Based Voice Recognition Using Intermediate Tables”

10. Claims 5,6,9 and 24 are objected to because of the following informalities:

As per claim 5, the phrase “accumulates it” is not clear. Upon further review of applicant’s disclosure, examiner notes that “it” refers to the distance information. Therefore, for art related examination purposes, examiner interprets “accumulates it” as “accumulates the distance information”. (Dependent claim 6 does not remedy claim 5, and is objected to as well).

As per claims 9,24, the phrase “when both or either one of the average and dispersion of the mixture multi-dimensional Gaussian distribution” is not clear (does the claimed average pertain to the average of the dispersion, or the average of the mixture). Upon further review of applicant’s disclosure and for art related examination purposes, examiner interprets the claim

scope of claim 9, including the phrase “when both or either one of the average and dispersion of the mixture multi-dimensional Gaussian distribution is changed by adaptation”, to be, changing the access pointer of the pointer table whenever change occurs (based upon adaptation) in one of the average parameter and the dispersion parameter, including the possibility that change occurs in both the average parameter and the dispersion parameter.

Appropriate correction is required.

Claim Rejections - 35 USC § 101

11. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

12. Claims 1-10,12-24 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claims 1-10,12-24 define non-statutory processes because they merely manipulate an abstract idea (mathematical algorithm) without a claimed limitation to a practical application. The disclosed invention has a practical application in the technological arts (e.g voice recognition using Hidden Markov Models); however, the claimed process, a series of steps to be performed on a computer, simply manipulates an abstract idea without a claimed limitation to the practical application and does not have any pre or post computer process activity.

The disclosed invention of the instant application pertains to voice/speaker recognition using Hidden Markov Models. This is a practical application within the technological arts.

However, the claimed invention pertains to processing of numerical values via feature vectors, lookup tables, and other mathematical calculations, which is a manipulation of an abstract idea without any limitation to a practical application. Examiner notes that this is prevalent with respect to claims 1-9,15-24. Claims 10,12-14 contain claim elements pertaining to speaker identification, however, the claim scope of speaker identification, with respect to claims 10,12-14, is a mathematical comparison between stored referenced data and current new data, said claim scope clearly being a manipulation of a mathematical algorithm. Claim 11 contains a switch, which by applicant's specification, is defined by physical circuitry; claims 25-27 are directed to a recording medium readable by a computer having a program recorded therein, wherein said program is executed under control of the computer; claim 28 is directed to the system using a battery powered data processor; hence, claims 11, 25-28 contain subject which has been deemed statutory under 35 U.S.C. 101.

Applicant should note, however, that claims directed to pre or post computer activity pertaining to speech signal processing, would be considered to be statutory subject matter. For example, the requirement of the measurements of physical objects or activities to be transformed outside of the computer into computer data (In re Gelnovatch, 595 F.2d 32, 41 n.7, 201 USPQ 136, 145 n.7 (CCPA 1979) (data- gathering step did not measure physical phenomenon); Arrhythmia, 958 F.2d at 1056, 22 USPQ2d at 1036), where the data comprises signals corresponding to physical objects or activities external to the computer system, and where the process causes a physical transformation of the signals which are intangible representations of the physical objects or activities. Schrader, 22 F.3d at 294, 30 USPQ2d at 1459 citing with

approval Arrhythmia, 958 F.2d at 1058-59, 22 USPQ2d at 1037-38; Abele, 684 F.2d at 909, 214 USPQ at 688; In re Taner, 681 F.2d 787, 790, 214 USPQ 678, 681 (CCPA 1982).

Examples of this type of claimed statutory process include the following:

- A method of using a computer processor to analyze electrical signals and data representative of human cardiac activity by converting the signals to time segments, applying the time segments in reverse order to a high pass filter means, using the computer processor to determine the amplitude of the high pass filter's output, and using the computer processor to compare the value to a predetermined value. In this example the data is an intangible representation of physical activity, i.e., human cardiac activity. The transformation occurs when heart activity is measured and an electrical signal is produced. This process has real world value in predicting vulnerability to ventricular tachycardia immediately after a heart attack.

- A method of using a computer processor to receive data representing Computerized Axial Tomography ("CAT") scan images of a patient, performing a calculation to determine the difference between a local value at a data point and an average value of the data in a region surrounding the point, and displaying the difference as a gray scale for each point in the image, and displaying the resulting image. In this example the data is an intangible representation of a physical object, i.e., portions of the anatomy of a patient. The transformation occurs when the condition of the human body is measured with X-rays and the X-rays are converted into electrical digital signals that represent the condition of the human body. The real world value of the invention lies in creating a new CAT scan image of body tissue without the presence of bones.

- A method of using a computer processor to conduct seismic exploration, by

imparting spherical seismic energy waves into the earth from a seismic source, generating a plurality of reflected signals in response to the seismic energy waves at a set of receiver positions in an array, and summing the reflection signals to produce a signal simulating the reflection response of the earth to the seismic energy. In this example, the electrical signals processed by the computer represent reflected seismic energy. The transformation occurs by converting the spherical seismic energy waves into electrical signals which provide a geophysical representation of formations below the earth's surface. Geophysical exploration of formations below the surface of the earth has real world value.

Examples of claimed processes that independently limit the claimed invention to safe harbor include:

-a method of conducting seismic exploration which requires generating and manipulating signals from seismic energy waves before "summing" the values represented by the signals (Taner, 681 F.2d at 788, 214 USPQ at 679); and

- a method of displaying X-ray attenuation data as a signed gray scale signal in a "field" using a particular algorithm, where the antecedent steps require generating the data using a particular machine (e.g., a computer tomography scanner). Abele, 684 F.2d at 908, 214 USPQ at 687 ("The specification indicates that such attenuation data is available only when an X-ray beam is produced by a CAT scanner, passed through an object, and detected upon its exit. Only after these steps have been completed is the algorithm performed, and the resultant modified data displayed in the required format.").

Examples of claimed processes that do not limit the claimed invention to pre-computing safe harbor include:

- "perturbing" the values of a set of process inputs, where the subject matter "perturbed" was a number and the act of "perturbing" consists of substituting the numerical values of variables (Gelnovatch, 595 F.2d at 41 n.7, 201 USPQ at 145 n.7 ("Appellants' claimed step of perturbing the values of a set of process inputs (step 3), in addition to being a mathematical operation, appears to be a data-gathering step of the type we have held insufficient to change a nonstatutory method of calculation into a statutory process.... In this instance, the perturbed process inputs are not even measured values of physical phenomena, but are instead derived by numerically changing the values in the previous set of process inputs.")); and

- selecting a set of arbitrary measurement point values (Sarkar, 588 F.2d at 1331, 200 USPQ at 135). If a claim does not clearly fall into one or both of the safe harbors, the claim may still be statutory if it is limited to a practical application in the technological arts..

Claim Rejections - 35 USC § 102

13. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

14. Claims 1,2,4,20,21,25, are rejected under 35 U.S.C. 102(e) as being anticipated by Yamada et al (5991442).

As per claim 1, Yamada et al (5991442) teaches:

"a data processing system wherein a data processor refers to an intermediate table and a numeric value table for HMM speech recognition with respect to a feature vector to compute an output probability represented by a mixture multi-dimensional Gaussian distribution" as CPU based system performing pattern recognition (Fig. 1; col. 5 lines 14-27) using a mixed Gaussian density distribution function (col. 8 lines 58-65) containing feature vectors (the Gaussian density function contains a parameter 'x' which is defined as the set of feature vectors – col. 7 lines 19-21), using an intermediate table (the quantization table → col. 6 lines 18-25), a numeric table (as the table look-up associating the feature vectors and the probability vectors, col. 6 lines 26-34),wherein the pattern recognition is applied to HMM's for speech recognition (col. 2 lines 10-15);

"said numeric value table has a region which contains numeric values of a plurality of types of one-dimensional Gaussian distributions" as looking up the Kth element of the lookup table associated with a distribution of feature vectors (col. 6 lines 29-33; examiner notes, as an example, the correspondence between each individual feature vector 'x^1_j' and it's probability $P^i_j(x^1_j)$; hence the fact that Gaussian density functions are used (col. 8 lines 58-65), the individual probability distribution function in col. 6 line 32 is a set of one-dimensional Gaussian distributions);

"said intermediate table has a region which is selected on the basis of a value of linear quantization for a value of a feature component of said feature vector and which contains address information indicative of a location of the value of said numeric value table" as Kj code values

associated with the input feature vector x, the association being the closest scalar quantization (col. 6 lines 18-25);

"said data processor linearly quantizes the value of said feature component, selects the intermediate table based on an access pointer for each feature component, acquires the address information from said selected intermediate table on the basis of said linearly quantized value, refers to the numeric value table with use of the acquired address information, and computes said output probability on the basis of the value referred to from the numeric value table" as scalar quantizing the feature vector x_j into a quantized version $x^{Kj}{}_j$ (col. 6 lines 19-25, and stored as a quantization code value); and then using the quantized value $x^{Kj}{}_j$ to access the calculated and associated probability functions (col. 6 lines 30-34; not only is the value $x^{Kj}{}_j$ used in the calculation of the probability values, $x^{Kj}{}_j$ is in essence the address pointer linking the initial feature vector x_j to the probability value $P^i{}_j(x^{Kj}{}_j)$.

As per claim 2, Yamada et al (5991442) teaches a data processing system as set forth in claim 1 (as the Yamada et al (5991442) reference applied above to claim 1),

"having a region for formation of an access pointer table which contains said access pointers arranged for the feature components for the respective multi-dimensional Gaussian distributions of a mixture multi-dimensional Gaussian distribution, and wherein said data processor selects the intermediate tables with use of the access pointer of said access pointer table" as generating a value $x_{j,Kj}$ for each dimension of the input vector (col. 9 lines 25-33; in this example, since there are M Gaussian distribution functions, the $x_{j,Kj}$ acts as access pointers for

the multi-dimensional Gaussian distribution, linking the input vector 'x' with output distribution as shown in equation (13), using a table lookup operation (col. 9 line 33).

As per claim 4, Yamada et al (5991442) teaches a data processing system as set forth in claim 1 (as the Yamada et al (5991442) reference applied above to claim 1),

"wherein said data processor repetitively refers to said numeric value table for each feature component to compute the values of the multi-dimensional Gaussian distributions, and repetitively computes the values of the multi-dimensional Gaussian distribution by a predetermined number of times to compute the output probability represented by the mixture multi-dimensional Gaussian distribution" as performing the generation of values $x_{j,Kj}$ for each dimension of the input vector (col. 9 lines 25-33; as discussed in claim 2 above);wherein the calculation of the distribution (by equation (13)) continues until an error function, measuring the error between the probability term and the approximate value (col. 10 lines 23-40). The number of times the error term is calculated is predetermined, based on the values of n and i. (n being the nth learning data and i being the number of reference patterns (col. 10, lines 37-39).

As per claim 20, Yamada et al (5991442) teaches:

"a method for computing an output probability of a mixture Gaussian HMM, comprising the steps of: using a numeric value table which contains numeric values of distributions based on a plurality of types of one-dimensional Gaussian distributions for HMM speech recognition with respect to a feature vector" as CPU based system performing pattern recognition (Fig. 1; col. 5 lines 14-27) using a mixed Gaussian density distribution function (col. 8 lines 58-65; examiner

notes that 'a plurality of types of one-dimensional Gaussian distributions' is by definition mixed Gaussian density distributions) containing feature vectors (the Gaussian density function contains a parameter 'x' which is defined as the set of feature vectors – col. 7 lines 19-21), a numeric table (as the table look-up associating the feature vectors and the probability vectors, col. 6 lines 26-34),wherein the pattern recognition is applied to HMM's for speech recognition (col. 2 lines 10-15);

"using an intermediate table which contains address information indicative of a location of a value of said numeric value table corresponding to a linearly quantized value of a feature component of said feature vector in a region selected based on the quantized value" as using an intermediate table (the quantization table → col. 6 lines 18-25), wherein Kj code values associated with the input feature vector x, the association being the closest scalar quantization (col. 6 lines 18-25);

"linearly quantizing the value of said feature component, selecting the intermediate table on the basis of an access pointer of each feature component, acquiring address information from said intermediate table selected on the basis of said linearly quantized value, referring to the numeric value table with use of the acquired address information, and computing the output probability represented by a mixture multi-dimensional Gaussian distribution" as scalar quantizing the feature vector x_j into a quantized version x^{Kj}_j (col. 6 lines 19-25, and stored as a quantization code value); and then using the quantized value x^{Kj}_j to access the calculated and associated probability functions (col. 6 lines 30-34; not only is the value x^{Kj}_j used in the calculation of the probability values, x^{Kj}_j is in essence the address pointer linking the initial feature vector x_j to the probability value $P^i_j(x^{Kj}_j)$.

As per claim 21, Yamada et al (5991442) teaches a method for computing an output probability of a mixture Gaussian HMM as set forth in claim 20(as the Yamada et al (5991442) reference applied above to claim 20),

"wherein the selection of said intermediate table is carried out with use of an access pointer table which contains said access pointers arranged therein for the respective feature components of the respective multidimensional Gaussian distributions for a mixture multidimensional Gaussian distribution" as generating a value $x_{j,Kj}$ for each dimension of the input vector (col. 9 lines 25-33; in this example, since there are M Gaussian distribution functions, the $x_{j,Kj}$ acts as access pointers for the multi-dimensional Gaussian distribution, linking the input vector 'x' with output distribution as shown in equation (13), using a table lookup operation (col. 9 line 33).

As per claim 25, Yamada et al (5991442) teaches:

"a recording medium readable by a computer and having a program recorded therein, wherein said program is executed under control of the computer, said program uses a numeric value table which contains numeric values of distributions based on a plurality of type of one-dimensional Gaussian distributions to input a feature vector for HMM speech recognition" as CPU based system performing pattern recognition (Fig. 1; col. 5 lines 14-27) using a mixed Gaussian density distribution function (col. 8 lines 58-65; examiner notes that 'a plurality of types of one-dimensional Gaussian distributions' is by definition mixed Gaussian density distributions) containing feature vectors (the Gaussian density function contains a parameter 'x' which is defined as the set of feature vectors – col. 7 lines 19-21), a numeric table (as the table

look-up associating the feature vectors and the probability vectors, col. 6 lines 26-34),wherein the pattern recognition is applied to HMM's for speech recognition (col. 2 lines 10-15);

"uses an intermediate table which contains address information indicative of a location of a value of said numeric value table corresponding to a linearly quantized value of a value of a feature component of said feature vector in a region selected based on the quantized value, uses an access pointer table which contains access pointers arranged therein for the respective feature components of the multidimensional Gaussian distributions of a mixture multidimensional Gaussian distribution" as using an intermediate table (the quantization table → col. 6 lines 18-25), wherein Kj code values associated with the input feature vector x, the association being the closest scalar quantization (col. 6 lines 18-25);

"linearly quantizes the value of said feature component, selects the intermediate table on the basis of the access pointer of each feature component in said access pointer table, acquires address information from said intermediate table selected on the basis of said linearly quantized value, refers to the numeric value table with use of the acquired address information, and compute the output probability represented by the mixture multi-dimensional Gaussian distribution" as scalar quantizing the feature vector x_j into a quantized version $x^{Kj}{}_j$ (col. 6 lines 19-25, and stored as a quantization code value); and then using the quantized value $x^{Kj}{}_j$ to access the calculated and associated probability functions (col. 6 lines 30-34; not only is the value $x^{Kj}{}_j$ used in the calculation of the probability values, $x^{Kj}{}_j$ is in essence the address pointer linking the initial feature vector x_j to the probability value $P^i{}_j(x^{Kj}{}_j)$.

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

16. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada et al (5991442) in view of Seide (5892960).

As per claim 3, Yamada et al (5991442) teaches a data processing system as set forth in claim 1 (as the Yamada et al (5991442) reference applied above to claim 1),

"wherein said entire distribution based on each of said one dimensional Gaussian distributions is represented by a 2^N numeric values" as the set of code values that represents the feature vector distribution, as an example, can be represented as a possibility of 8 values (fig. 3, subblock 301 has 8 possible values, or 2^3 possible values).

Yamada et al (5991442), does not discuss the location of the N bit representation to be in the upper N bit range (examiner notes that applicant's discuss a shift into the upper range, as disclosed in Fig. 10). However, Seide (5892960) teaches the manipulation of bit information representing pattern recognition processes (in particular HMM's → col. 1 lines 43-55) to load the bit representations into the upper registers (col. 14, lines 37-38). Therefore, it would have been obvious to one of ordinary skill in the art of speech recognition modeling at the time the

invention was made to modify the position of the bit information as taught by Yamada et al (5991442) into the upper registers of the data block because it would be useful in taking advantage of the particular application or processor being used to perform the pattern recognition (Seide (5892960),col. 14 lines 32-33, referring back to Seide (5892960) col. 3, lines 24-52, wherein the problem to solve is to manipulate the bit data structure for faster processing).

17. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada et al (5991442) in view of Tran (6070140).

As per claim 28, Yamada et al (5991442) teaches a data processing as set forth in claim 1 (as Yamada et al (5991442) is applied to claim 1 above); but teaches the HMM based recognition to be performed on a cpu based processor with input and output (col. 5 lines 17-22; Fig. 1), however, Yamada et al (5991442) is silent to using a battery powered data processing system. However, Tran (6070140) teaches performing HMM recognition (col. 18 lines 40-45) to be used in a small battery powered device (Fig. 8, a wristwatch, which can inherently operates with less than 1 watt power consumption). Therefore, it would have been obvious to one of ordinary skill in the art of speech recognition devices at the time the invention was made to modify the recognition system of Yamada et al (5991442) to be used in a low power consumption device because it would advantageously allow for the entry of spoken information into a personal information management system, such as portable computers (Tran (6070140),col. 2 lines 26-36).

Conclusion

18. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Digalakis et al (6256607) teaches using intermediate tables in HMM processing to improve performance time (fig. 2-3; col. 9 line 15 – col. 12 line 65.

Gupta et al (6009390) teaches varying Gaussian mixture components (fig. 3-4)

Beyerlein et al (5933806) teaches multivariable Gaussian representations (col. 2 lines 10-30).

Rigazio et al (6526379) teach a calculation of Bhattacharyya distance between centroids. (fig. 3).

Rahim (5960397) teach splitting recognition models according to acoustic backgrounds,

Zeljkovic (5778341) teach a local logi-likehood calculation in a HMM (col. 1 lines 60-65).

Kimber et al (5598507) teach clustering of speaker models based on a distance calculation.

Juang et al (4783804) teach covariance and mean calculations in a HMM (abstract)

Ostendorf et al (5839105) teach split codevectors in a mixture Gaussian representation of HMM's (abstract)

Bahler (5271088) teach interframe distance and averaging in speaker spotting (abstract).

Juang, B.H. et al, ("Vector equalization in hidden Markov models for noisy speech recognition" ICASSP-92, Vol. 1, 23-26 March 1992 Page(s):301 – 304) teaches performs singular dispersion estimates.

Zhao ("A speaker-independent continuous speech recognition system using continuous mixture Gaussian density HMM of phoneme-sized units", Speech and Audio Processing, IEEE

Transactions; Volume 1, Issue 3, July 1993 Page(s):345 – 361) teaches mixture Gaussian densities.

19. Any response to this action should be mailed to:

Commissioner of Patents and Trademarks
Washington, D.C. 20231
or faxed to:
(703) 872 9314,
(for informal or draft communications, please label "PROPOSED" or "DRAFT")

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington. VA., Sixth Floor (Receptionist).

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Opsasnick, telephone number (571)272-7623, who is available Tuesday-Thursday, 9am-4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Wayne Young, can be reached at (571)272-7582. The facsimile phone number for this group is (571)272-7629.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group 2600 receptionist whose telephone number is (571) 272-2600, the 2600 Customer Service telephone number is (571)272-2600.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

mno
9/4/05

Michael N. Opsasnick
Examiner
Art Unit 2655